Impact of AIRS Retrievals on Forecast Skill using the GEOS-5 DAS

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Special Thanks

- Michele Rienecker and the GMAO for providing the GEOS-5 DAS and the technical support needed to set up and run these experiments.

- AIRS team at JPL and the Sounder Research Team at NASA Goddard for providing the retrievals used in this experiment.

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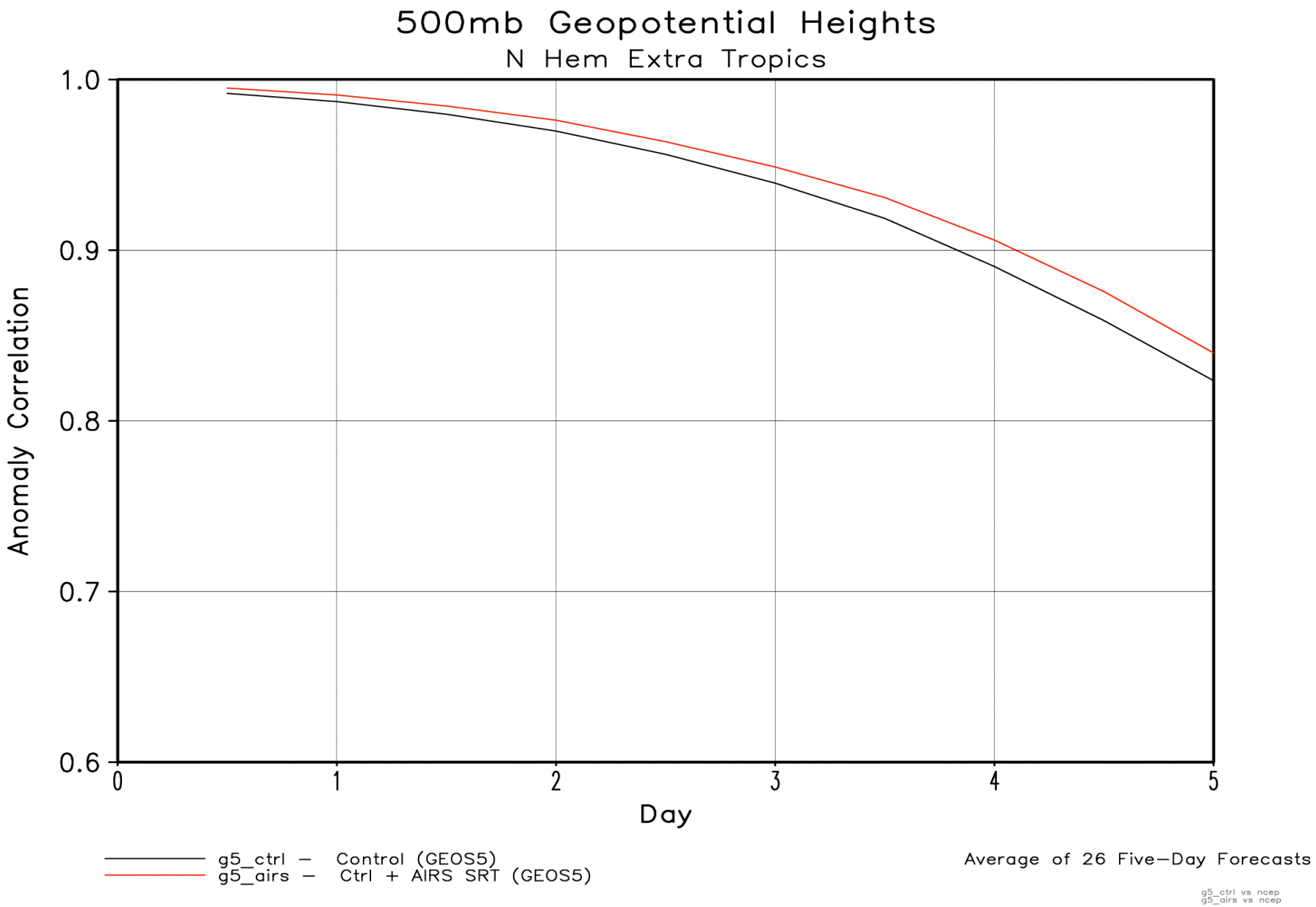
Assimilation Runs

- We generated two GEOS-5 assimilation runs:
  - Control assimilation is the GEOS-5 DAS Version beta7P2 at 1x1 degree resolution, run 12/17/02 through 1/31/03
  - AIRS assimilation is the 1x1-deg. GEOS-5 DAS Version beta7P2 with same data as control plus AIRS retrievals added as rawinsonde temperature profles. It was run from 1/1/03 through 1/31/03.
  - Retrievals used for the AIRS assimilation were produced by the Version 4 AIRS algorithm, and thinned for input to the assimilation by using every other data point.

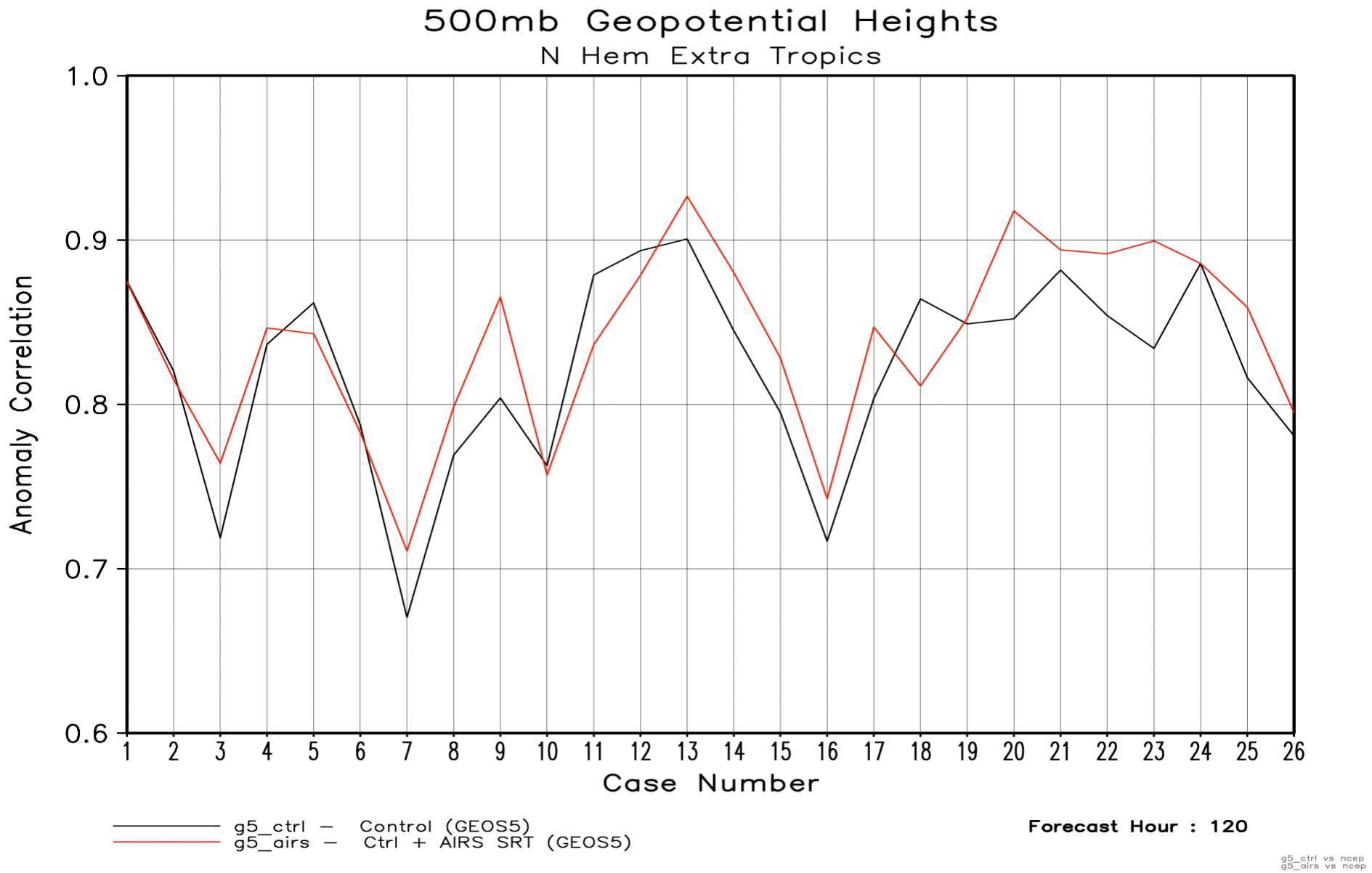
Forecast Runs

- We ran two sets of 26 5-day forecasts, initialized at 00Z each day, from 1/6/03 through 1/31/03:
  - "Control" set initialized from the control assimilation
  - "AIRS" set initialized from the AIRS assimilation
  - We skipped first 5 days to allow for spin-up of the AIRS assimilation.
- We verified both the control and AIRS forecasts against the NCEP analysis

Result – average of 26 GEOS-5 AIRS forecasts vs. 26 GEOS-5 Control forecasts



Individual Forecast Anomaly Correlations

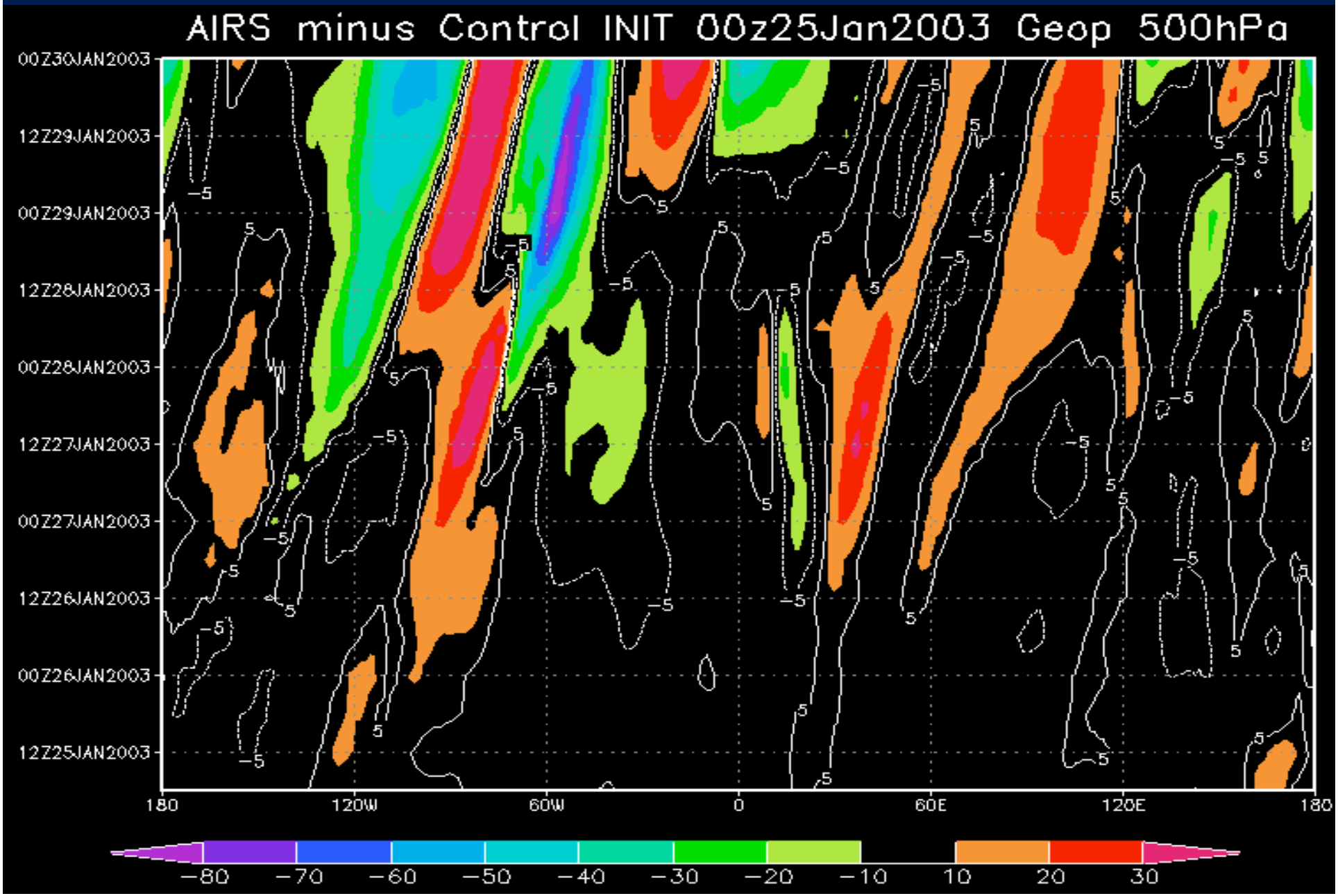


Case Selection

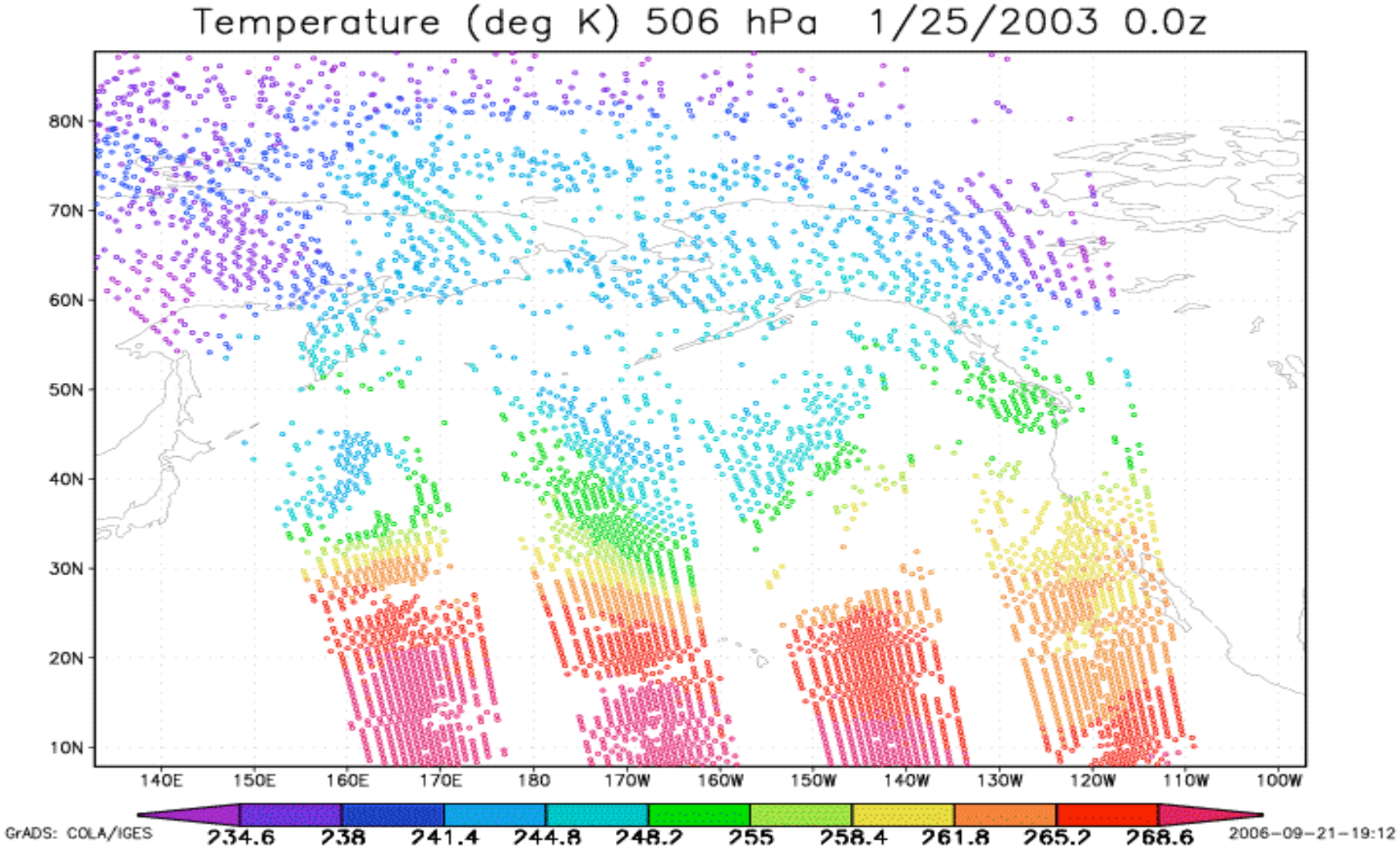
- We then looked in the Northern Hemisphere Extra-tropics for a link between the data at the initial condition and a synoptic event that was better forecast when initialized using the AIRS assimilation

- We wanted to look at a case where the control did reasonably well and AIRS showed notable improvement. The forecast initialized at Jan. 25 (case 20) met this criterion.

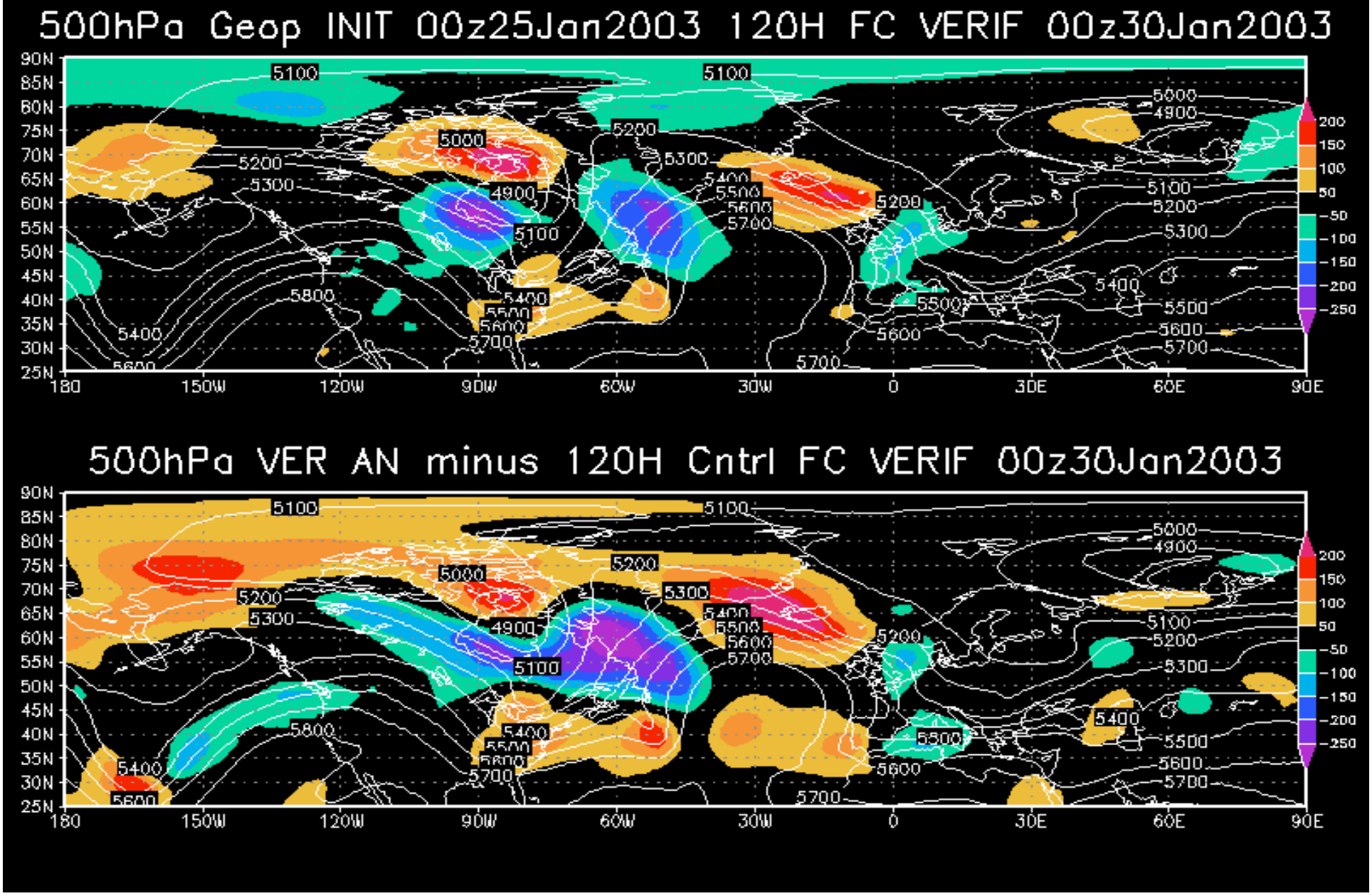
Averaged 30N to 60N



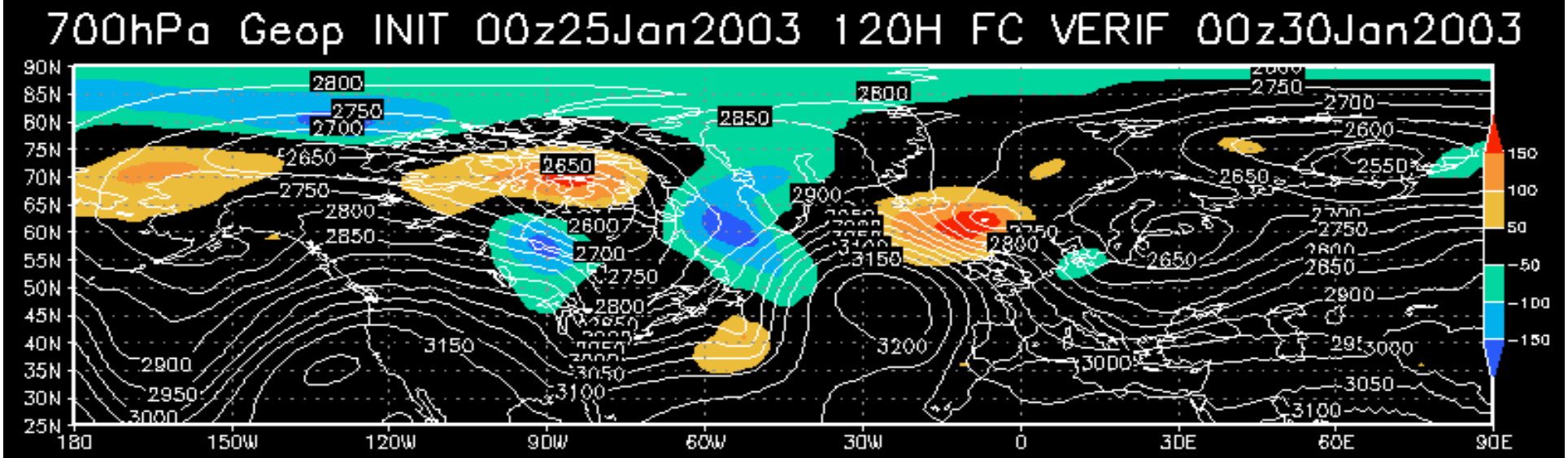
AIRS data over N. Pacific used by assimilation on 00 GMT Jan. 25, 2003

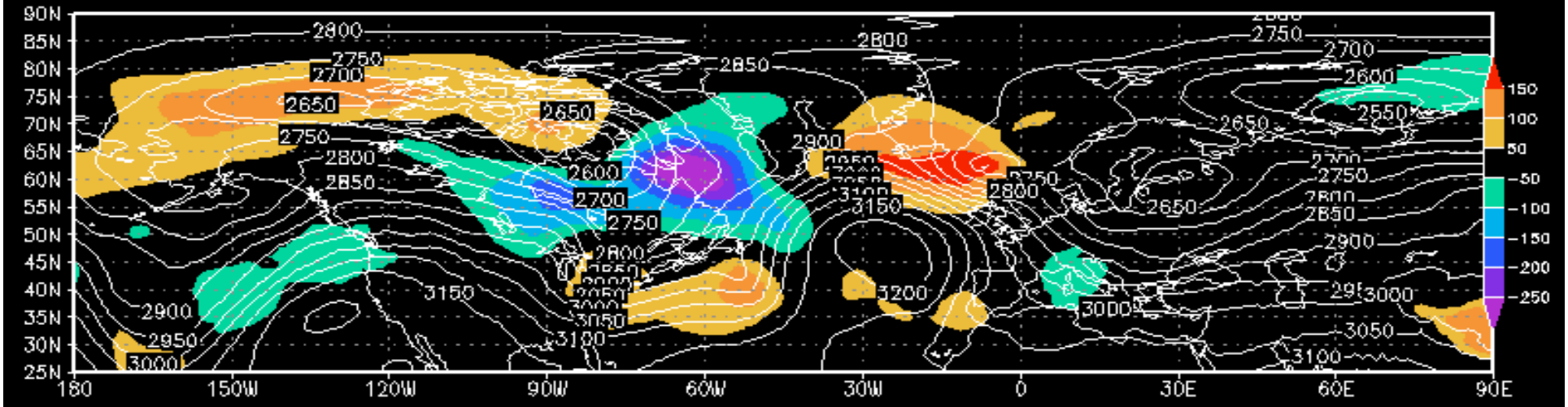


Top panel shading is AIRS minus Control
Bottom panel shading is NCEP minus control



Top panel shading is AIRS minus Control
Bottom panel shading is NCEP minus control





Summary

- The addition of AIRS temperature retrievals in the GEOS-5 DAS produced a meaningful improvement in 5-day forecast skill in the Northern Hemisphere extra tropics, averaged over a sample of 26 forecasts in January 2003.

- A selected case showed a link between a perturbation in the initial height field over the northeastern Pacific Ocean by the insertion of AIRS data, and an improved 5-day forecast over Canada and the N Atlantic.

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Future Work

- This was a very preliminary study. We plan to evaluate all cases of meaningful impact, both positive and negative, and document the impact and its dynamic response.
- We plan to extend the forecasts to 10 days, to be consistent with other NWP studies.
- We want to collaborate with the GMAO to document the impact of using AIRS radiance assimilation in GEOS-5, and examine cases of significant impact.
- We plan to re-run these experiments using Version 5 retrievals.

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700 mb TEMPERATURE (K)
January 25, 2003